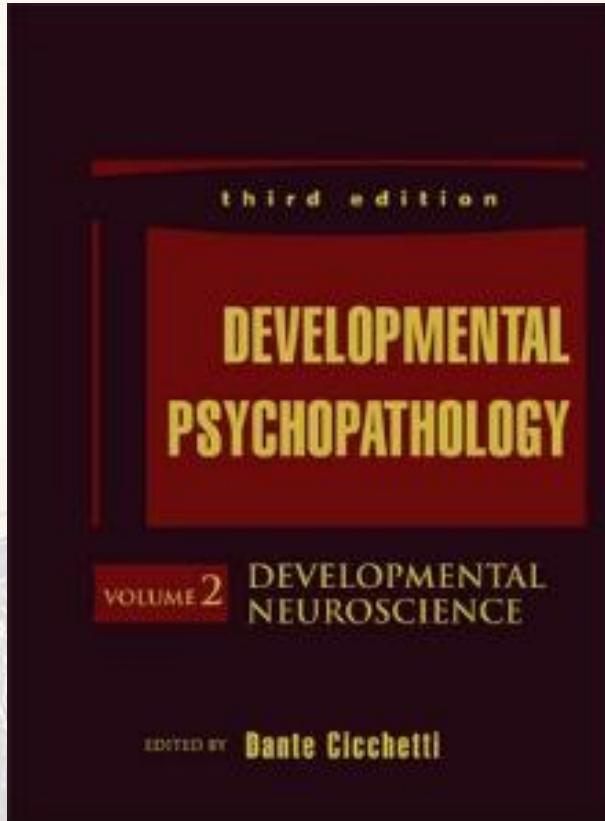


Chapter 4



JAMES F.  
LECKMAN

# *Understanding Developmental Psychopathology:*

## *How Useful Are Evolutionary Perspectives?*

Presenter : Maryam Mohagheghi ,MD

# OUTLINE:

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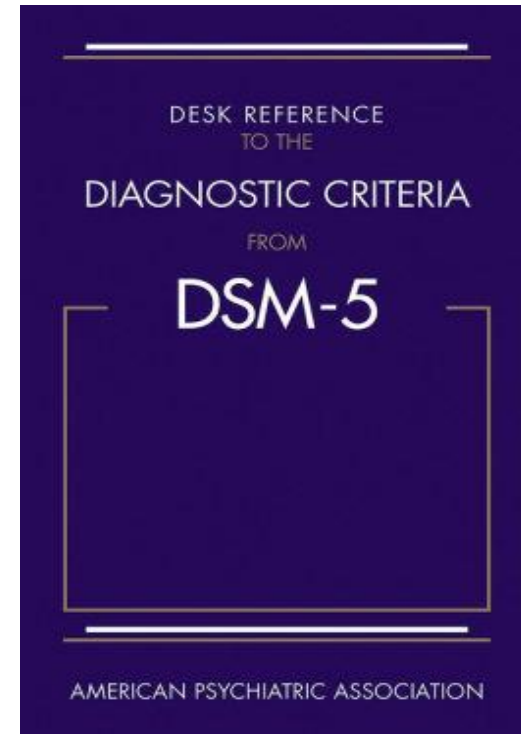
- **INTRODUCTION**
- **GOALS OF EVOLUTIONARY EXPLANATIONS**
- **EVOLUTIONARY MECHANISMS THAT MAY ACCOUNT FOR THE PERSISTENCE OF DISCRETE FORMS OF PSYCHOPATHOLOGY**
- **CONCLUSIONS AND CRITIQUE**

# Introduction

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## *DSM-5:*

- Reifies psychopathological states as categorical entities that are modeled after discrete medical disorders.
- A serviceable and generative approach
- Well suited to today's medical marketplace.



## Weaknesses of *DSM-5*:

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- Reflection of the conventional wisdom of a committee of experts
- Ignoring the dimensional properties of the syndromes
- failure to provide a dynamic framework

# GOALS OF EVOLUTIONARY EXPLANATIONS

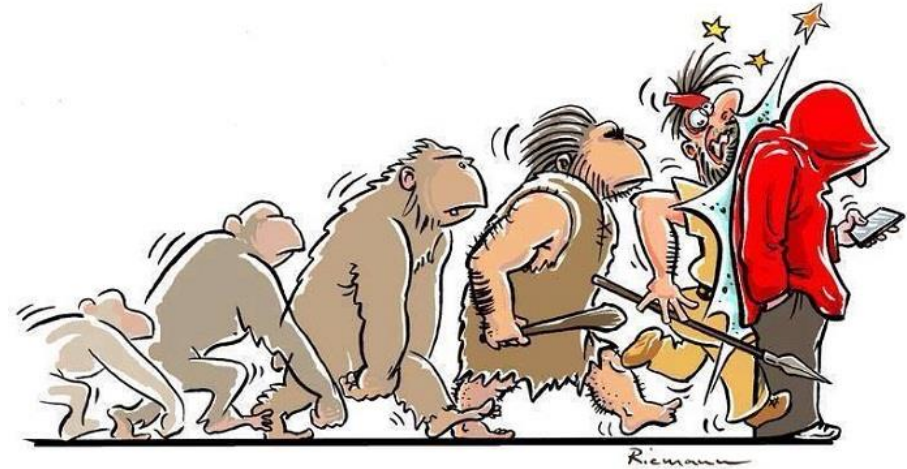
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To provide a coherent framework to view persistent maladaptive behavior patterns in human populations.

# Darwin's (1859) principle of natural selection

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- I. Variation among individuals
- II. Differential reproductive success
- III. Differential inheritance



# Paradoxical or not paradoxical?!

## That is the question

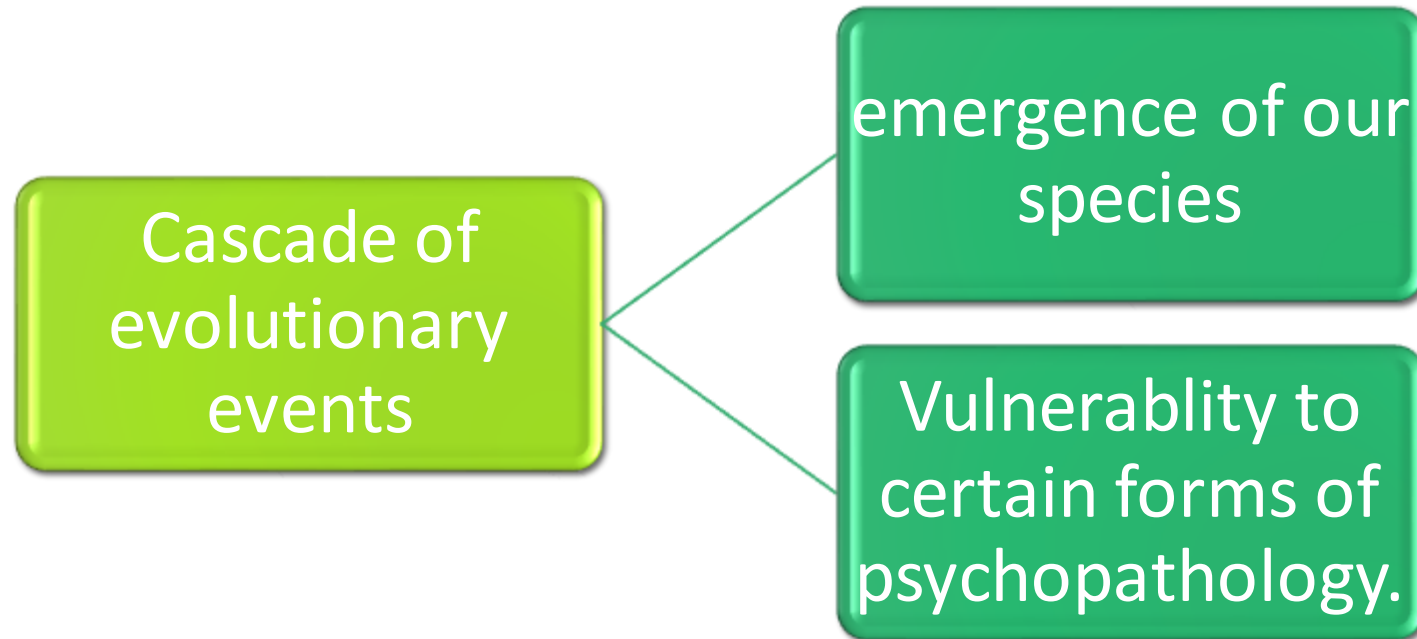
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- The issue of persistence appears to be paradoxical
- Psychopathological behavior can be maladaptive & adaptive at the same time



# Thesis

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# EVOLUTIONARY MECHANISMS THAT MAY ACCOUNT FOR THE PERSISTENCE OF DISCRETE FORMS OF PSYCHOPATHOLOGY



Failure of *Conserved Patterns of Behavior* to Develop Normally

Dysregulation of conserved neurobehavioral systems

Environmental shifts and the value of diversity at the population level

Co-optation of conserved neurobiological systems

Evolutionary arms races

# Failure of *Conserved Patterns of Behavior* to Develop Normally

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Fragile X

Prader-  
Willi  
syndrome

Angelman  
syndrome

Autism  
spectrum  
disorder

# *Fragile X Syndrome*

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- Single-gene disorder
- Etiology:
  - Genetic anticipation (trinucleotide CGG repeat >200)
  - Regulatory region
- A permutation (200 > repeat > 50) expands to a full mutation only when it is transmitted by a female.
- Daughters of a male with a premutation have only a premutation and remain unaffected.



# *Prader-Willi syndrome*

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- Genomic imprinting
- Molecular mechanisms
  - Paternal deletion
  - Maternal uniparental disomy
  - Imprinting defect



# Angelman Syndromes

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## Etiology

Loss of expression of two maternally imprinted genes

Genomic imprinting leads to:

- Alter the dosage of particular genes
- Non- Mendelian mechanisms.



# Autism spectrum disorder

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Reser (2011)

- Some genes associated with ASD enhance reproductive fitness
- Assortative mating

Autistic-like traits might benefit society as a whole.

Environmental insults are associated with and increase the likelihood of ASD

- Fathers over the age of 50 years
- The immigrant status of the mother
- Prenatal nutrition
- Pregnancy and birth complications
- Gestational diabetes



# EVOLUTIONARY MECHANISMS THAT MAY ACCOUNT FOR THE PERSISTENCE OF DISCRETE FORMS OF PSYCHOPATHOLOGY

Failure of *Conserved Patterns of Behavior* to Develop Normally

→ Dysregulation of conserved neurobehavioral systems

Environmental shifts and the value of diversity at the population level

Co-optation of conserved neurobiological systems

Evolutionary arms races

# Dysregulation of conserved neurobehavioral systems

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- Inappropriate time
- Too high intensity
- Not turned off in a timely fashion



**Consistent phenotype of maladaptive behavior**

Major  
Depression

OCD



## *Mood and Anxiety Disorders*

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Anxiety and fear are evolved, adaptive responses evident in our mammalian ancestors.



Charles Darwin

# *Mood and Anxiety Disorders*

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The psychic distress informs the sufferer that something needs to change in their interpersonal world and perhaps be avoided in the future.



# *Mood and Anxiety Disorders*

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Need for help and support



# *Mood and Anxiety Disorders*

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As well as an increasing self-awareness that might be useful to disengage from commitments to unreachable goals.



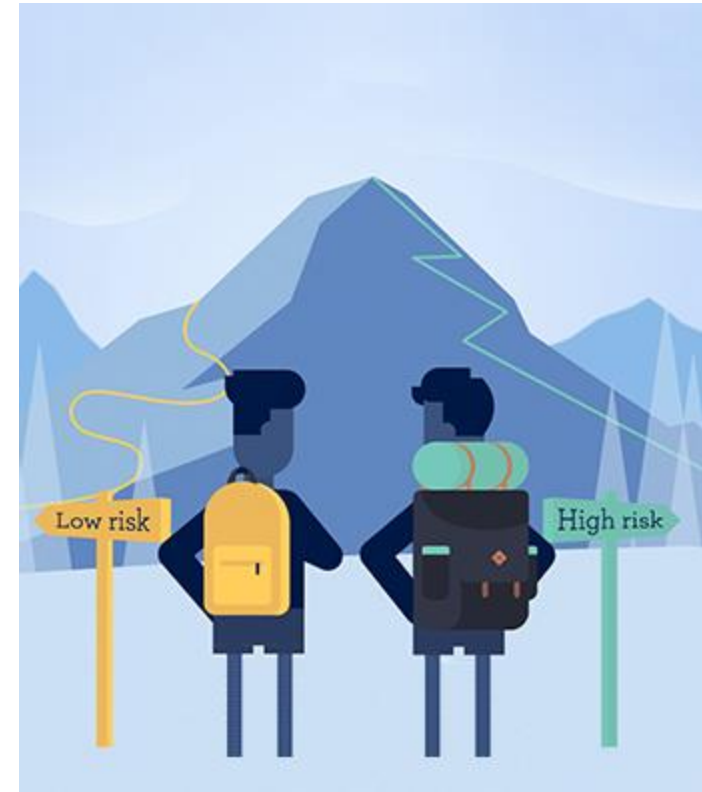
# *Mood and Anxiety Disorders*

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- Depressed mood
- Pessimism
- Lack of motivation



**Fitness advantage**



# *Mood and Anxiety Disorders*

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## **Analytical rumination (AR) hypothesis**

- Depression and related forms of mental distress are adaptive in that they provide a mechanism for the individual to engage in sustained analysis (rumination) of complex problems until a viable solution is reached.



# OCD

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- An ancient alarm system that may have served well our hunter–gatherer ancestors
- Beginning in the second year of life
  - intrusive thoughts, habits, and routines, some of which closely resemble the behaviors associated with OCD
- Bedtime fears (fear of the dark, of monsters) were related to hoarding objects.
- Fear of death was significantly associated with strong attachment to a specific object.



# OCD

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## Initiation of parenting

- harm-avoidant preoccupations
- harm avoidant behaviors

Many OC symptoms appear normally during the course of development and confer some degree of reproductive fitness





# EVOLUTIONARY MECHANISMS THAT MAY ACCOUNT FOR THE PERSISTENCE OF DISCRETE FORMS OF PSYCHOPATHOLOGY

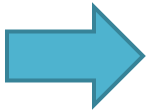
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# Ancient Versus Current Environments and the Value of Diversity Within Populations

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- As modern societies shift away from their agrarian pasts, certain behavioral traits might become less adaptive (e.g. ADHD)



# *Attention-Deficit/Hyperactivity Disorder*

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Our ancestral environments that were unsafe, impoverished, and time critical.

The advantages of maintaining a response-ready versus a problem-solving attitude



# *Attention-Deficit/Hyperactivity Disorder*

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**The advantage of  
distractibility**

Threats and opportunities



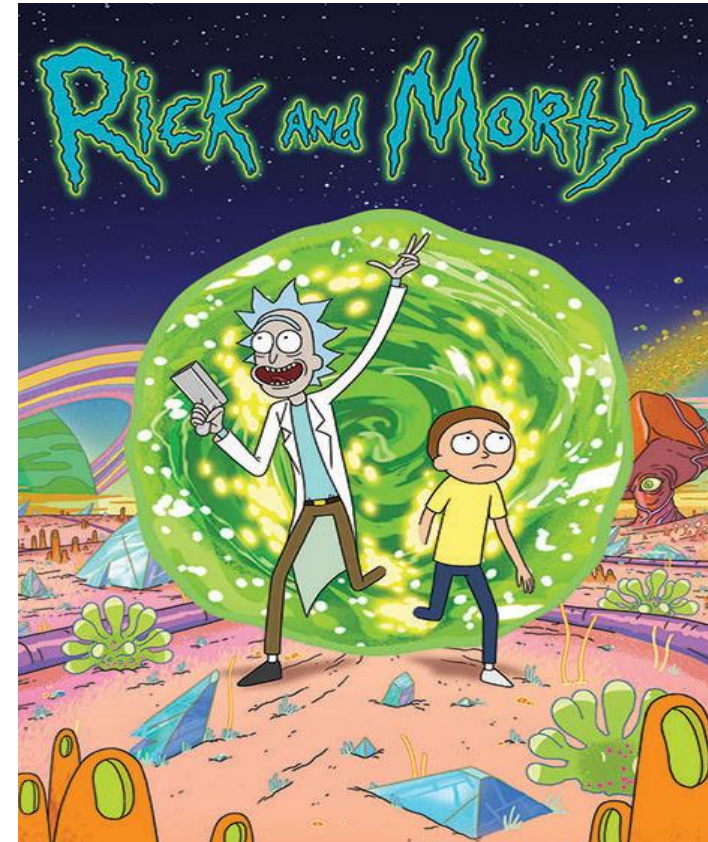
# *Attention-Deficit/Hyperactivity Disorder*

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## **Novelty seeking**

Willingness to depart from local environments predisposed to high levels of prenatal and perinatal stressors.

Potential positive founder effects upon discovery of novel, resource-rich environments



# *Attention-Deficit/Hyperactivity Disorder*

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Williams and Taylor (2006)

- Increased environmental variability
  - reduction in population predictability.
- Unpredictable behavior can optimize the survival
- Reproductive bias favoring the unpredictable individuals
  - Coping with rapid environmental change

# EVOLUTIONARY MECHANISMS THAT MAY ACCOUNT FOR THE PERSISTENCE OF DISCRETE FORMS OF PSYCHOPATHOLOGY

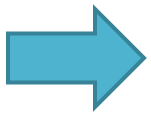
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# Co-optation of conserved neurobiological systems

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Conserved neurobehavioral systems are highly dependent on specific neurobiological substrates.

Some of these pathways can be co-opted or hijacked by exogenous substances, leading to addiction.





# *Substance Use Disorders and Addictive Disorders*

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Addiction

Substance Use



**Vulnerability to  
psychopathology**

# EVOLUTIONARY MECHANISMS THAT MAY ACCOUNT FOR THE PERSISTENCE OF DISCRETE FORMS OF PSYCHOPATHOLOGY

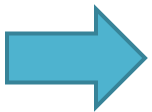
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# Evolutionary arms races

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- **Evolutionary relationship with bacterial and viral pathogens**
- Post-infectious autoimmune disorders:
  - Sydenham's chorea
  - PANDAS



# But this PANDAS is not that lovely cute PANDAS!

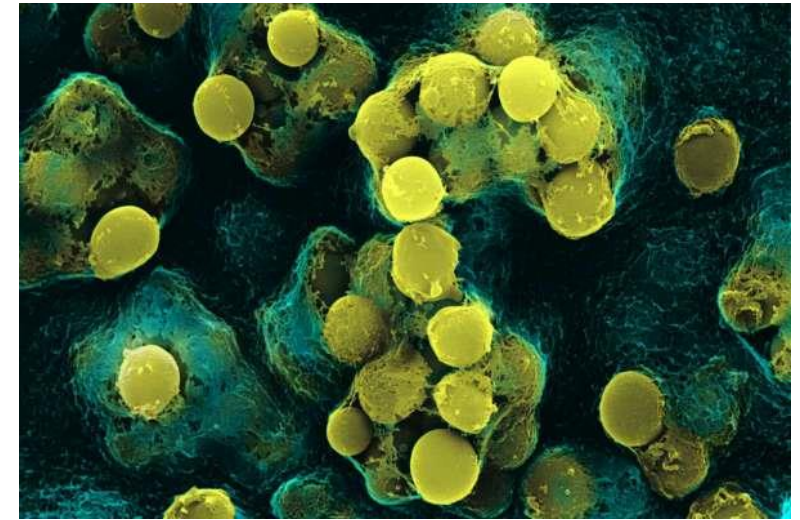
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## Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal Infections

- Sudden OCD in children
- Dopamine Effect

### Evolutionary perspective:

Permanent home - Continued vulnerability



# Other Evolutionary-Based Explanations

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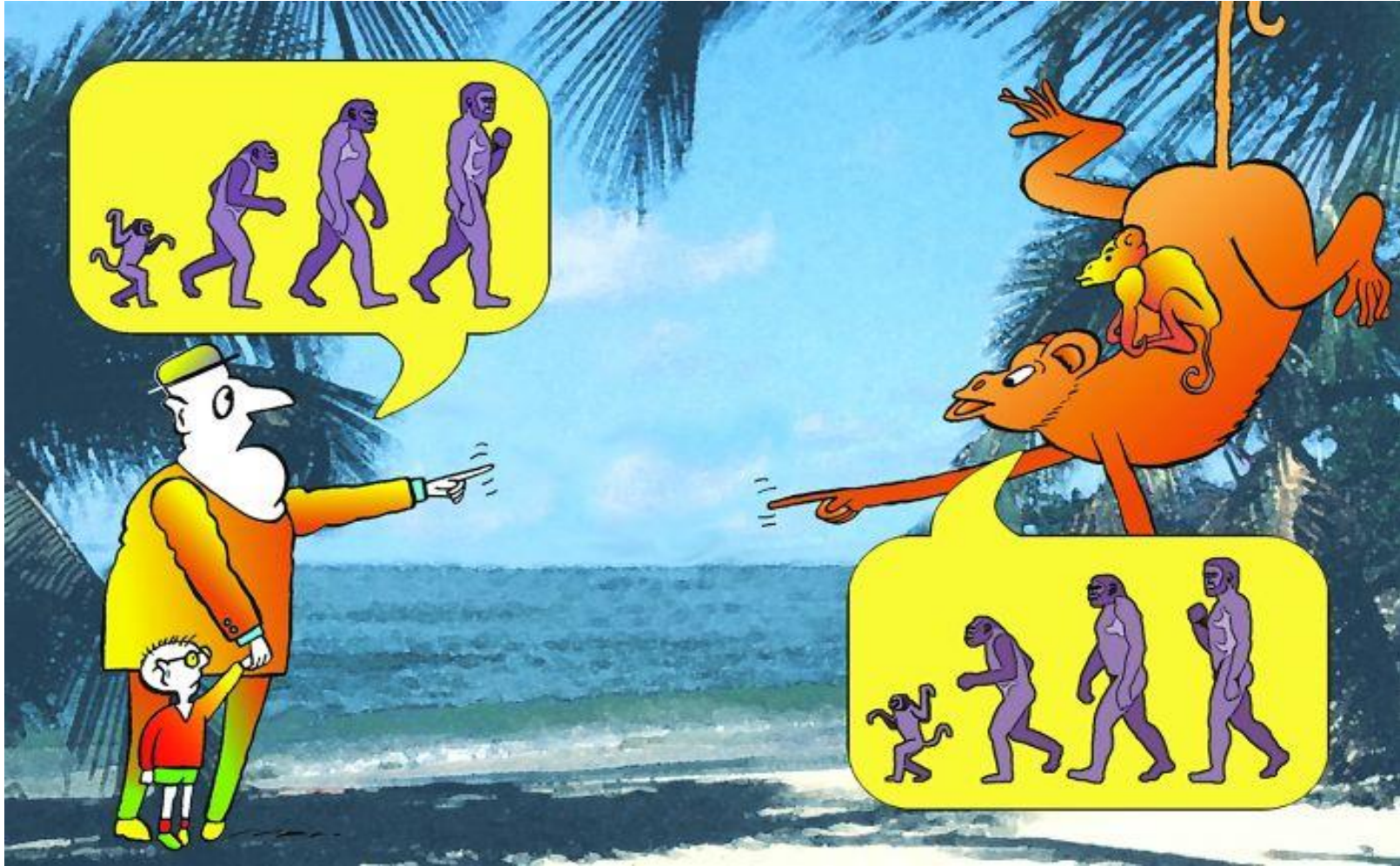
- Limited power of natural selection
- Inbreeding & Consanguineous marriages

# CONCLUSIONS AND CRITIQUE

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the limited power of natural selection to eliminate mutations, particularly recessive mutations, if their adverse effects on reproductive success are modest.

inbreeding and consanguineous marriages which are common place in many cultures do have the potential to disrupt neurodevelopmental pathways and cause early onset neuropsychiatric disorders.



Thanks!